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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/918,257	07/30/2001	Geoffrey B. Gretton	RPC-6US	2240
7590			EXAMINER	
03/22/2004			ANGEBRANNDT, MARTIN J	
Maurice M. Klee, Ph.D.			ART UNIT	PAPER NUMBER
Attorney at Law			1756	
1951 Burr Street				
Fairfield, CT 06824				

DATE MAILED: 03/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/918,257

Applicant(s)

GRETTON ET AL.

Examiner

Martin J Angebrannt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 1/12/2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 24-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 24-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/12/2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

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1. The response by the applicant has been read and given careful consideration. Responses to the arguments of the applicant are presented after the first rejection to which they are directed. The non-elected claims have been cancelled. Rejection of the previous office action, not repeated below, are withdrawn. The two IDS referred to by the applicant have been reviewed, signed, initialed and are returned with this mailing.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3 Claims 1-13 and 24-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

If the master is the negative of the surface configuration of the microlens array, then only only step (i), where the microlens array is directly cast/formed from the master or cases where two generations of masters are used to form from that master a microlens array which has the negative configuration from the original master. Section (ii) does not specify two masters being made and as discussed previously, this is a required step.

The original is a negative of the desired lens, the first generation master is a positive of (just like) the desired microlens array and the second generation master would be the negative of the desired microlens array.

The applicant could obviate this rejection by inserting in section (ii) after "produce" –an intermediate master and using it to produce - - . This would make it clear that only masters bearing negative patterns are used in the stamping processes and would ensure completeness in the claims (see MPEP 2172.01, 707.07(j)). The examiner contends that the intermediate master

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formation is an essential step to clearly establish the relationship between the “photoresist master” and the “further master”.

4 The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5 Claims 1-13 and 24-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification while providing a description of scanning [0049 in prepub], does not disclose other relative movement of the beam and resist, such as that taught by Brueck et al. (rotational movement). The applicant may replace “relative” with - - translational scanning- -- in the next response to cure this defect and obviate the new matter issue.

6 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7 Claims 1-5, 7-13 and 24-28 are rejected under 35 U.S.C. 103(a) as obvious over Hutley, M.C., “Optical Techniques for the generation of Microlens Arrays”, J. Mod. Opt., Vol. 37(2) pp. 253-265 and Gale “Direct writing or continuous-relief micro-optics”, in “Micro-optics, elements, systems and application”, Herzig, Ed. PP 87-125.

Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265 uses a positive acting AZ-1400 resist which is exposed to the interference pattern of three laser beams which are negative lenses. (page 256 and figure 4a). "The equivalent positive lenses may be derived from them by replication". (page 256) With adjustment of the beams, the resist pattern may be that formed in figure 5a, which can be reflowed slightly to form the hexagonal pattern shown in figures 5b and 5c.

Gale "Direct writing or continuous-relief micro-optics", in "Micro-optics, elements, systems and application", Herzig, Ed. PP 87-125 teaches direct laser writing of microlens arrays. This technique has the advantage of being able to be fabricated directly from design data by a single exposure step (page 87). The ability to fabricate various refractive and diffractive lenses, including the interlacing of various microstructures and the ability to form complex structures is disclosed. (pages 87-88). The direct writing process obviates the submicron alignment required by multiple exposure steps. (page 88). The use of positive resists in the direct writing process is disclosed. (page 89 and 98) The formation of lenslet arrays with any lenslet shape and virtually zero dead space is disclosed. (page 102). The ability to write non-spherical profiles is disclosed. (page 102) as is the general ability to write a wide range of micro-optical elements (page 121). The transfer of the pattern into the underlying substrate to form a more robust stamper is also disclosed (page 121). The time required to form the pattern is disclosed as only a minor disadvantage due to the formation of stampers. (page 90)

It would have been obvious to one skilled in the art to modify the process of exposing a resist using interference and directly forming a high fill/ high efficiency replica lens array of Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol.

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37(2) pp. 253-265 by using the scanning laser techniques disclosed by Gale "Direct writing or continuous-relief micro-optics", in "Micro-optics, elements, systems and application", Herzig, Ed. PP 87-125 to allow the pattern to be written directly from design data without being constrained to patterns able to be formed by interference techniques with a reasonable expectation of success based upon the disclosure of the formation of lens arrays of virtually any shape with virtually zero dead space taught within Gale on page 102 without the need heating or modified development.

Alternatively It would have been obvious to one skilled in the art to modify the process of Gale "Direct writing or continuous-relief micro-optics", in "Micro-optics, elements, systems and application", Herzig, Ed. PP 87-125 by forming high fill patterns such as those disclosed by Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265 to form more useful and efficient lens arrays and forming the replicas directly from the resist pattern to form several copies, rather than merely one of the desired array with a reasonable expectation of success based upon the disclosure of the formation of lens arrays of virtually any shape with virtually zero dead space taught within Gale on page 102.

The examiner notes that the pattern of Hutley on page 256 has a high fill factor of approximately 100% and as the triangular portions are also focussing elements a high focusing efficiency is also achieved. The applicant argues that none of the prior art suggests improvements in the focusing efficiency of 50-100%. The examiner notes that this is not present in the independent claim and points to the close packing of the lenses in the arrays in the prior art (page 256 in Hutley M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265, figures 4,6,9, and 12 in Hutley GB 2223861, Figure 18 in

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Sugawara et al. '977 and Aoyama et al. '455 in general). The examiner does believe that while the triangular portions between circular lenses shown on page 256 of Hutley are less efficient than the circular lenses and therefore the focusing efficiency of the lens array might be reduced, the independent claim has yet to exclude the production of this type of array or to address this point. The examiner notes that this is not the case for the hexagonal close packed situations and the overlap of the formed lenses taught by Aoyama et al. '455. The closest prior art is not that applicant's figure 7a, but the negative pattern of Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265. With positive resists, the areas exposed is removed/ renders soluble, the exposure is from the topside of the resist (opposite the substrate surface) and overlapping exposure is cumulative, therefore one of ordinary skill in the art would recognize that each lens could essentially be formed by a single laser pulse, but that the overlap of the exposure of adjacent lenses would also contribute to the final lens shape due to the cumulative exposure. As the exposures are overlapping, near 100% fill would be achieved easily without the overlapping (edges being limited explicitly by the resolution). When a positive resist is used to form the convex shapes, the resolution at the edges is limited by the resolution/focussing spot size of the beam used in the exposure. The examiner notes that in figures 23 and 24, the positive resist is used with overlapping exposure of the adjacent beams. The examiner also points to the use of overetching to produce the same effect as shown in figures 9a-d of JP 11-344602).

8 Claims 1-5, 7-13 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265 and and Gale "Direct writing or continuous-relief micro-optics", in

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“Micro-optics, elements, systems and application”, Herzig, Ed. PP 87-125, in view of Shvartsman ‘689.

Shvartsman ‘689 describes the coating of a photoresist film on a substrate , embossing a pattern into it , curing it while in contact, peeling and transferring the relief image in the photoresist film to another surface by stamping. (8/56-9/21) The use of roller or flat die shapes is disclosed. (9/22-55). See also the examples. Holograms can include images and or text stored holographically.

It would have been obvious to one skilled in the art to modify the process of Hutley, M.C., “Optical Techniques for the generation of Microlens Arrays”, J. Mod. Opt., Vol. 37(2) pp. 253-265 by replicating the interferometrically produced microlens array by using it as a stamper based upon the known use of photoresists bearing interferometrically produced holographic patterns as evidenced by Shvartsman ‘689.

9 Claims 1-13 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugawara et al. ‘977, in view of Hutley, M.C., “Optical Techniques for the generation of Microlens Arrays”, J. Mod. Opt., Vol. 37(2) pp. 253-265, Gale et al. ‘030 and Aoyama et al. ‘455.

Sugawara et al. ‘977 teaches with respect to figures 23 and 24, the use of positive resists and to directly pattern a positive resist to form a concave microlens array. (10/1-24) The desirability of close packing is disclosed with respect to the hexagonal shapes of figure 18. (9/7-10).

Gale et al. ‘030 teach the use of laser scanning of positive resists to form microlenses. (see figures and 3/18-25,3/60-4/42)

Aoyama et al. '455 teach fill factors and forming lenses close to each other so that their profiles intersect. The light utilization of approximately 100% can be achieved (2/7-10)

It would have been obvious to modify the process of Sugawara et al. '977 by using lasers for the exposure as this is known in the art as evidenced by Gale et al. '030 and replicate a positive (convex) lens array from the negative (concave) lens array based upon the direction within Hutley, M.C., "Optical Techniques for the generation of Microlens Arrays", J. Mod. Opt., Vol. 37(2) pp. 253-265 and to ensure that the lenses were packed closely together based upon the teachings within Sugawara et al. '977 and Aoyama et al. '455 concerning efficiency of the lens array

10 Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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11 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebrannndt whose telephone number is 571-272-1378.

The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Martin J Angebrannndt  
Primary Examiner  
Art Unit 1756

03/15/2004